$_{bs}F_uA_{nt}]$

$_{s}F_uA_{nt}$

$) = 3.5in^2$

$= 4.5in^2$

$= 409$

$) = 413$

^{k}

$=$

$\times 1/2 = 625$

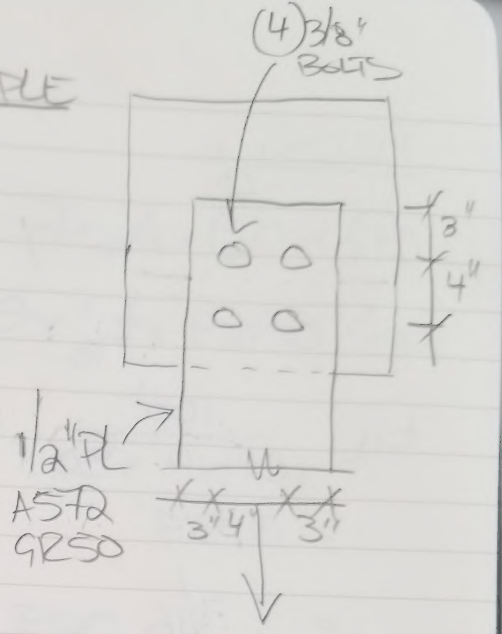
$= 2.75in^2$

423^k

389

^{k}

BLOCK SHEAR EXAMPLE



ORIGINAL STRENGTH:

$\phi P_n = 0.9 \times \left(\frac{1}{4}\right)(10") \times 50^{k}$

$= 112.5^{k}$

NEW STRENGTH =

YIELD:

$\phi P_n = 0.9 \times \left(\frac{1}{2}\right)(10") \left(50 ksi\right)$

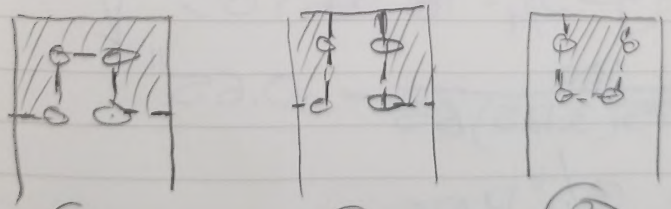
$= 225^{k}$

FRACTURE:

$\phi P_n = 0.75 \left(\frac{1}{2}\right)\left(10 - 2 \times \left(\frac{3}{8} + \frac{1}{8}\right)\right) \times 65$

$= 219^{k}$

BLOCK SHEAR



Mode ① $\phi R_n = \phi \left[0.6 F_u A_{nv} + U_{bs} F_u A_{nt} \right]$

$\leq \phi \left[0.6 F_y A_{gv} + U_{bs} F_u A_{nt} \right]$

$F_y = 50 \quad F_u = 65$

$A_{nv} = 2 \times \left(4 - 3\tfrac{1}{8} - 1\tfrac{1}{8}\right)\left(\tfrac{1}{2}\right) = 3.5 \text{ in}^2$

$A_{nt} = \left(10 - 2\left(3\tfrac{1}{8} + 1\tfrac{1}{8}\right)\right)\left(\tfrac{1}{2}\right) = 4.5 \text{ in}^2$

$A_{gv} = 2(4)\left(\tfrac{1}{2}\right) = 4 \text{ in}^2$

UNIFORM

$R_n = 0.6 \times 65 \times 3.5 + 1.0 \times 65 \times 4.5 = 409$

$\leq 0.6(50)(4) + (1.0)(65)(4.5) = 413$

$\phi R_n = 0.75 \times 413^k = \underline{309^k}$

Mode ②

$A_{nv} = 2 \times \left(7 - 1.5 \times \left(3\tfrac{1}{8} + 1\tfrac{1}{8}\right)\right) \times 1\tfrac{1}{2} = 6.25$

$A_{nt} = 2 \times \left(3 - 1\tfrac{1}{2} \times \left(3\tfrac{1}{8} + 1\tfrac{1}{8}\right)\right) \times 1\tfrac{1}{2} = 2.75 \text{ in}^2$

$A_{gv} = 2 \times 7'' \times 1\tfrac{1}{2} = 7 \text{ in}^2$

$R_n = 0.6 \times 65 \times 6.25 + 1.0 \times 65 \times 2.75 = 423^k$

$\leq 0.6 \times 50 \times 7 + 1.0 \times 65 \times 2.75 = 389$

$\phi R_n = 0.75 \times 389 = \underline{291^k}$

MODE ③

$A_{nv} = 6.25\ in^2$ (SAME AS MODE ②)

$A_{nt} = (4 - 3/8 - 1/8)(1/2) = 1.75\ in^2$

$A_{gv} = 7\ in^2$ (SAME AS MODE ②)

$\phi R_n = 0.75 \times 324 = \underline{243^k}$ GOVERNS

FOR BLOCK SHEAR

BOT.

$\underline{219^k}$ GOVERNS OVERALL (FRACTURE)

SINCE $219^k > 112.5^k$ (ORIGINAL STRENGTH), PLATE OK!